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Project Title: Children's understanding of text and interpretation

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ABSTRACT

For large-scale projects, please provide in the space below an abstract of not more than 300 words, single-spaced, written in a language that may be understood by the informed layperson. For small-scale projects, an abstract per se may not be appropriate, and the report itself may be started below.

Children's understanding of text and interpretation.

This project is directed to an understanding of what is involved in young children's language and literacy development. There is ample evidence that children's language develops, especially over the pre-school years, and that children's literacy development occurs rapidly during the school years. The concern of this project is the relations between the two. We advanced and have tested several hypotheses as to what ways literacy affects language.

The primary finding is that literacy development alters children's relation to language. In the course of becoming literate children begin to differentiate the meaning in the language from the meaning entertained by the speaker. We have shown this development through a variety of tasks all of which have a similar form, namely, that the textual or sentence meaning is at variance with the speaker's intention or the listener's interpretation. Younger children fail to distinguish the two; they claim that the intended meaning is what the sentence means. We hypothesize that this is because they are not fully literate. Older, literate, schooled children distinguish the two, claiming that there is a difference between what was actually said, what was intended and how it was interpreted. We also show that these effects are greatly enhanced by the use of written as opposed to spoken utterances.

We explain these developments in terms of children's acquisition of metalinguistic concepts for referring to meaning. In the coming year we hope to more firmly establish and to extend these findings and to, thereby, enhance our understanding of just what children are learning when they learn to read and write.

Year-End Report

Children's Understanding of Text and Interpretation[1]

David R. Olson and Nancy Torrance

Description of Activities

What does a text "say"?

It is now widely held that reading is not simply a matter of letter or word recognition but rather a matter of the "recovery of meaning." The nature of that meaning, however, has remained somewhat puzzling. One possibility is that the meaning is the "sentence meaning," the meaning specified by the sentences themselves independently of the writer's intention. The second is that the meaning of a text is the intention held and expressed by the writer. (See Olson, in press: Appendix A.)

These different assumptions yield somewhat different pedagogical programs, the one more attentive to the formal features of a text, the latter to the more interpretive aspects of a text.

Our program of research is directed, not to the attempt to determine which of these is the more valid assumption but rather to attempt to spell out the changes in children's understanding of what a text means. Our hypothesis, stated in our proposal, was that children's understanding of the relation between a text and its interpretation progresses through three stages. These stages map more or less directly onto the notion of invariance of text:

1. *Text as intentional structure.* Interpretation is simply grasping the intentional structure of the text. A text is invariant if it generates the same interpretation on subsequent presentation. A story told in different words would be the same "text," that is, the same story.

2. *Text as literal meaning.* Interpretation is taken to be comprehension of *the* meaning of the text. The text is assumed to have one wording or form, and only one interpretation. At this level, children become literal-minded; interpretations arrived at are assumed to be in the text.

3. *Text as interpretable semantic structure.* A text is what is invariant across the interpretations or construals it allows. Interpretation is a matter of grasping those possible meanings. At this level, children would recognize the possibility of ambiguity and multiple interpretations of a fixed text.

In the research we have carried out in the past year, we have examined children's understanding of the relations between texts and interpretations in oral and written contexts. We have conducted a major experiment designed to test these hypothesized stages and the effects of two variables, namely, repetition of a critical message, and the

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provision of a written version of the message, on children's interpretations of ambiguous utterances. We have also carried out a second study to clarify children's notions about meaning, interpretation and misinterpretation, by classifying their responses to questions about what was said, meant and understood in terms of the three levels of understanding of the text/interpretation distinction set out above. In addition, in collaboration with our graduate students, Naida Graham, Nandita Babu, Ted Ruffman, Tom Keenan and Deborrah Howes, we have begun a series of studies on related aspects of this understanding. We shall discuss these studies in turn.

1. *Children's understanding of ambiguity and interpretation: The Say/Mean distinction.*

The major study by Torrance, Howes and Olson involved a version of our "Red Shoes" task involving stories in which the critical sentence of the story is ambiguous, allowing the possibility that the speaker intends the sentence one way and the listener interprets it another way. In a typical case, one of the characters *wants* her *new* red shoes but she asks only for her red shoes. A second character, not knowing her intention but hearing her request brings some red shoes, but, on half the items, not the red shoes that were wanted. The experimental subject upon hearing this illustrated story is then asked a series of questions designed to assess their understanding of the story and their ability to distinguish what was said from what was intended:

1. Did Linus do what Lucy wanted him to do?

2. Did Linus do what Lucy said to do?

3. What did Lucy ask Linus to bring?

4. What were the exact words that Lucy said? She said "Linus, bring me ..."

5. Did Linus know which red shoes Lucy wanted him to bring?

6. Did Lucy tell him which red shoes to bring?

7. (Optional question - wrong shoes brought) Something went wrong, didn't it? Whose fault was it? _____ Why do you say so? _____

The study conducted in the past year was designed to extend our earlier studies (Torrance and Olson, 1987; Appendix B.) of the say/mean distinction in three ways. First by asking a fuller set of questions of the children we hoped to elaborate just where the difficulty with this distinction lies. Second, it was designed to eliminate the possibility that children fail to distinguish what was said from what the speaker meant by it because they fail to attend to the speaker's utterance when they are listening to the story. And, third, it was designed to provide some indication of the role of written text in children's understanding of the invariance of "what was said."

Hence, two major variables in addition to age, were whether or not subjects repeated the ambiguous message at the time of initial presentation, and whether or not a written version of the message was shown to subjects at the time of initial presentation. Subjects were randomly assigned to one of four conditions:

1. No Written Message; No Repetition of Message

2. No Written Message; Repetition of Message

3. Written Message; No Repetition of Message

4. Written Message; Repetition of Message

In the written message conditions, the wording of Questions 3, 4 and 6 was altered to take into account the change in the presentation of the ambiguous message. Hence, Questions 3 and 6 began "In her note, ..." and Question 6 was replaced with "What were the exact words in Lucy's note? It said, 'Linus, bring me ...'"

A total of 126 English-speaking children were tested, 64 from SK and 62 from Grade 2. Each child was presented with two pair of stories. Within each pair, an identical ambiguous utterance led to the intended outcome in one story (Match Condition) and to the unintended outcome in the other story (Mismatch Condition). Within each group, the order of stories within pairs, the order of pairs presented, and the order of Outcome condition was counterbalanced. There were 16 subjects from each Grade in each condition except that there were only 15 Grade 2 subjects in both Written Message conditions.

In looking at subjects' responses to the series of questions, we have so far examined in detail their performance on three questions (Questions 3, 4 and 6 above). Responses to Questions 1 and 2 are taken as control questions to insure the Subject has attended to the story and indeed performance on these questions is essentially perfect for both grade levels. In order to asses the effects of the Written Message, of Repetition and of Outcome Condition, in addition to Grade level on subjects' overall ability to discriminate what was said from what was meant, a Four-way ANOVA with repeated measures was performed on measures of subjects' accuracy in answering the three questions (Ask for, Exact words and Tell which). Since subjects received two stories in each of two conditions, the maximum score per condition is 6. A similar Four-way ANOVA was performed on measures of subjects' accuracy in answering Question 4 alone as we hypothesized differences in the recall of the exact words of the message depending on the condition of Presentation (Written/Non-Written and Repeated/Non-Repeated). The results of these analyses are shown in Tables 1 and 2.

Source	Mean Square	df	F	p
Grade	47.62466	1	14.02	.0003
Written/Non Written	92.70663	1	27.29	.0000
Error	3.39654	118		
Match/Mismatch	2.87056	1	3.12	.0797
Error	.91893	118		

Table 1: Results of ANOVA on Measures of Accuracy for Questions 3, 4, and 6 Combined

As can be seen in Table 1, for Questions 3, 4 and 6 combined, significant effects were obtained for Grade (SK Mean 4.16; Grade 2 Mean 5.03), and for Written vs. Non-Written Presentation conditions (Written Mean 5.2; Non-Written Mean 4.0). There was no significant overall effect for Repetition vs Non-Repetition of the critical utterance, and finally, there was a tendency for subjects to perform better when the story outcome was *not* the one intended by the speaker (Mismatch Mean 4.7) than when the story ended as the speaker intended (Match Mean 4.5).

Source	Mean Square	df	F	p
Grade	2.95519	1	6.68	.0109
Written/Non Written	12.80663	1	28.97	.0000
Repetition	1.88224	1	4.26	.0413
Error	.44209	118		
Match/Mismatch	.57814	1	2.90	.0913
Error	.19951	118		

Table 2: Results of ANOVA on Measures of Accuracy for Question 4

The results of the Analysis of Variance on subjects' accuracy in answering Question 4 (What were the exact words ...), shown in Table 2, yielded significant effects for Grade (SK Mean 1.5; Grade 2 Mean 1.75), for Written vs. Non-Written Presentation of the message (Written Mean 1.9; Non-Written Mean 1.4), and as expected for Repetition vs. Non-Repetition of the critical utterance (Repetition Mean 1.7; Non-Repetition Mean 1.5). As before, there was a tendency for subjects to perform better when the story outcome was *not* the one intended by the speaker than when it was (Mismatch Mean 1.7; Match Mean 1.6).

The effects of the two independent variables, namely, asking the subjects to repeat the critical utterance upon hearing it, and delivering the critical sentence in written in addition to oral form provided support for our original hypothesis. Repeating the utterance did improve children's performance on the exact words question. Noteworthy, however, is the fact that although they now recalled the exact words better they did no better on the task as a whole. That is, an improvement in recall of the message did not influence their recognition that the utterance was ambiguous.

The effects of repetition of the critical sentence observed in this study replicated those found in our earlier study (Torrance and Olson, 1987; p. 140-141). That study reported that even when the Kindergarten and Grade One children repeated perfectly what had been said, they continued to claim that the listener did not do what the speaker had said to do. In fact, the listener had done what the speaker had told her to do, namely, bring the red shoes, but not what the speaker had wanted her to do, namely bring the *new* red shoes.

The second independent variable, the use of a written message, had a dramatic effect on children's performance on this task. Although the written message was removed before the Subject was asked to recall what the message said, subjects who were shown the message at the time of initial story presentation were better able to recall the exact words of the message *and* to recognize that the speaker had not indicated which red

shoes the listener was to bring. That is, with a written message, the children came to distinguish what the speaker had said from the speaker's intention. This corroborates an earlier finding of Bonitatibus and Flavell (1985) that it is easier for first grade children to detect ambiguity in a message which is presented in a written as well as oral mode.

Furthermore, a preliminary analysis of the responses to the blame question (Question 7) suggests that, as a consequence of making the required distinction between the intended and expressed meanings, children given the written messages also were less likely to blame the listener than were children not given the written message. We will be further analyzing this data over the next few months.

In order to consider in greater detail precisely which strategies subjects were using in responding to the demands of the task, patterns of responding to Questions 3, 4 and 6 were considered and, where appropriate, Chi-Square Analyses were performed on the frequencies of key response patterns. We found that all subjects' responses could be categorized into one of five patterns, four of these varying along a continuum from complete conflation to complete differentiation of *said* and *meant*. The fifth pattern of responding is marked by inconsistency in answering the three questions: Subjects claimed in these cases that the exact words of the message were *new red shoes* on the one hand but that the speaker did not say which red shoes. These somewhat anomalous responses accounted for only 9% of the data overall, 7% in the Grade 2 data and 11% in the SK data. Furthermore, this response pattern occurred most frequently in the Non-Written conditions of presentation (74% of Category 5 responses were in the Non-Written conditions).

The results of this analysis suggests that there are indeed dramatic differences in the interpretive assumptions that children bring to a text. The simplest response pattern, the pattern which occurred more frequently in the youngest subjects than in the older ones (11% of responses vs. 5.5% for SK and Grade 2 respectively), was to simply conflate the meaning of the text with the intended meaning of the speaker. Thus, if the speaker intended to ask for the "new red shoes" but, in fact, said simply "red shoes," these subjects conflated the two, replying that what the speaker had wanted was the "new red shoes" and recalling the speakers' utterance as "new red shoes." Furthermore, they claimed that the speaker had told the listener which red shoes she wanted. This corroborates our first hypothesis.

The next response pattern to emerge, occurring at least once in 13 of the 64 SK subjects (20%), is to begin to recall the speaker's exact words, "red shoes" but to claim that the speaker had stated which red shoes to bring. Again this pattern occurs most frequently in the youngest group of subjects; only 5 Grade 2 subjects (8%) produced this pattern of responding. When responding to items in this way, subjects appear to recall the exact text but believe the text means more than the wording specifies. We take this to be evidence for our second hypothesis, namely, that children take their interpretations to be in the text.

The third response pattern, found in our data, is to claim that the speaker *asked for* the new red shoes while acknowledging that the speaker has said only "red shoes" and that the speaker had not told the listener which red shoes. It could be argued that these subjects took the "ask" question as equivalent to a "want" question.

Although these three response patterns occurred more frequently in the younger subjects, there was no clear indication of an ordering of these response patterns. It is not clear that simply conflating what was said with what was meant is better or worse than distorting the sentence to fit the interpretation.

The fourth strategy is clearly superior and occurs more frequently in the older subjects (70% of Grade 2 responses vs 46% of SK responses). This response pattern would occur when subjects understood both what the speaker meant to say and what the sentence actually said. Hence, they can both recall what was said and that the speaker had not told the listener which red shoes were wanted. In addition, they report that while the speaker had wanted the new red shoes, she had asked only for the red shoes. For these cases, these children, in line with our third hypothesis, are recognizing the possibility of ambiguity and multiple interpretations of a fixed text. Results of Chi-Square Analyses on the frequency of subjects achieving this level of responding are presented below in Tables 3 and 4.

Match Condition:

Strategy 4 Response

	+	-
SK	39	25
Gr. 2	55	7

$\chi^2_{(1)} = 12.82$, $p<.0001$

Mismatch Condition:

Strategy 4 Response

	+	-
SK	42	22
Gr. 2	51	11

$\chi^2_{(1)} = 4.51$, $p<.05$

Table 3: Frequency of Subjects In Each Grade Showing Complete Differentiation of Said and Meant At Least Once in Response to Questions 3, 4 and 6 Combined

As can be seen in Table 3, significantly more Grade 2 subjects reached this fourth adult-like pattern of responding than SK subjects for both Match and Mismatch Story Outcome conditions. Furthermore, as can be seen in Table 4, significantly more subjects in the Written presentation condition achieved adult-like responding than in the Non-Written presentation condition, again for both Match and Mismatch Story Outcome conditions. Chi-squares performed on the frequency of this response pattern for the Repetition vs. Non-Repetition conditions failed to reach significance. These analyses tend to corroborate the findings of the Analyses of Variance, showing that, not only is the distribution of responses different across Grade level and conditions of presentation (written or not written), but also that the distribution of subjects recognizing ambiguity and discriminating what was said from what was intended also differs across Grade level and mode of presentation.

We take these findings as strong confirmation of our hypotheses regarding the development of children's abilities to distinguish an utterance from the speaker's intentions in producing it and to focus upon the former, and further, of the importance of writing in coming to make this distinction.

Match Condition:

Written Presentation	Strategy 4 Response +	Strategy 4 Response -
+	53	9
-	41	23

$x^2_{(1)} = 7.63$, $p<.01$

Mismatch Condition:

	Strategy 4 Response +	Strategy 4 Response -
+	54	8
-	39	25

$x^2_{(1)} = 11.15$, $p<.0001$

Table 4: Frequency of Subjects in Written vs. Non Written Condition of Presentation Showing Complete Differentiation of Said and Meant At Least Once in Response to Questions 3, 4 and 6 Combined

Perner, Leekam and Yuill (in press) have recently reported a study of children's developing understanding of the relations between what is said and what is meant that nicely extends our work on the say/mean distinction. Four and six year old children were asked to judge and comment on what a listener (a puppet) would think upon hearing an ambiguous message generated by a speaker (another puppet). (Although they seem complex, these tasks work beautifully with children when they get into the spirit of the game!) Our earlier studies had shown that when children hear an ambiguous message (e.g., "Bring the red shoes" when there are two pair of red shoes) younger children knowing what the speaker wanted ("The new red shoes") think the listener should have known which red shoes to bring. Perner and his colleagues added an important twist which permitted them to distinguish exactly what the younger children are basing their judgments on. By hiding an object in the puppet-speaker's absence, they created a false belief in the speaker. The speaker then generated an ambiguous message which could refer either to the true location known to the child-subject or to the location falsely believed by the speaker. The question is: What do child-subjects think an innocent listener will think upon hearing the speaker's ambiguous message? The correct answer, of course, is that the listener won't know because the "text" is ambiguous. Older subjects do this. But four and six year olds think the listener will come to share the false belief with the speaker. They commit the intentionalist fallacy. Because the speaker meant "new red shoes" when he said "red shoes" they think the utterance meant "new red shoes" and that a listener will think "new red shoes." Older subjects distinguish what the speaker intended (speaker meaning) from what the sentence means (sentence meaning).

In our original proposal we stated that we would test children from three grade levels, SK, Grade 2 and Grade 4. We did not run this experiment with Grade 4 children because pilot work suggested that children's performance would be so close to ceiling at this grade level for three of the four conditions under investigation, as to make the data uninformative for the present purposes. Rather we chose to collect a more complete set of data on the SK and Grade 2 subjects, running four completely crossed conditions of presentation instead of the originally proposed three.

2. *Children's explanations of interpretation, misinterpretation and possible interpretations in listening to texts read aloud.*

We have continued a second series of studies (Torrance, Bell and Olson) designed to clarify children's notions about meaning, interpretation and misinterpretation. The format is similar to that mentioned above; subjects listen to stories containing utterances which are lexically or referentially ambiguous when taken out of context. These stories are constructed so that a listener-character is always absent when the disambiguating information is given, returning to hear the speaker's utterance which is then misinterpreted. Experimental subjects are provided with the necessary information to infer both the meaning intended by the speaker and the meaning taken by the listener. After listening to each story, subjects are asked a series of questions about what was *said*, what was *intended* and in what way the message was *misinterpreted*, along with some more standard recall and inference questions. Questions of the following form were asked.

For the target utterance "Where's the pitcher?" which is ambiguous between a *pitcher* of lemonade and the *pitcher* in a baseball game:

1. When Lucy was ready to start the game, what did she ask for? She asked for ...

2. What were her exact words? She said "Let's get this game started. Where's ...

3. Why did Lucy say "That's not what I meant?

4. What did Lucy mean when she said "Where's the pitcher?"

5. What did Linus think Lucy meant when she said "Where's the pitcher?"

One major goal of the present study was to develop criteria for classifying the responses to these questions in terms of the three levels of understanding of the text/interpretation distinction set out above. We have achieved reasonable success with this aspect of the project, as we shall describe presently, although we now feel a somewhat different experimental paradigm may lead to even greater success in this direction.

The data we report now was collected on 48 English-speaking children from a middle class school in Toronto, 16 children at each of three grade levels, Grade 1, 3 and 5. We had proposed originally to collect data from slightly younger groups of subjects (SK, Grade 2 and Grade 4) but found the task too difficult for SK subjects in pilot testing carried out earlier in the year. It is partly for this reason that we now propose to vary the experimental paradigm somewhat.

Subjects were seen individually and were shown illustrations of the Peanuts characters while four different stories were read to them. The children were instructed to listen carefully to each story so that they would be able to answer questions after each one. At the end of each story, three *recall* and two *inference* questions were asked followed by the *say/mean* questions. The *mean* questions were given in the following manner: The first question (Q3 above) aimed for a response that included both the intended meaning and the misinterpreted meaning. If the subject failed to mention one or both of these, the

two follow-up questions (Q4 and Q5) were both asked. The first of these asked for the intended or speaker's meaning, the second asked for the listener's interpretation. Initially, the *say* and *mean* questions were scored correct if the critical information was included in answers to the initial or subsequent probe questions.

The *recall* questions were asked primarily as control questions to insure subjects attended and recalled the facts of the story. There were no grade effects for the *recall* questions, performance on these questions being high for all three grade levels (92% for Grade 1, 89% for Grade 3 and 100% for Grade 5). Grade differences were obtained for the *inference* questions ($F_{2,45} = 13.25$, $p < .001$), with Grade 5 subjects performing significantly better than Grade 3 and Grade 1 subjects. A similar pattern of results was obtained for the *mean* questions ($F_{2,45} = 17.07$, $p < .001$). Finally, There was a small but significant grade effect on the *say* questions ($F_{2,45} = 3.54$, $p < .05$), with Grade 5 performance slightly better than Grade 1 performance.

To examine the relationship between the ability to draw inferences and to infer the speaker's and listener's meanings, Pearson correlations were calculated. At the Grade 1 level, the relationship is positive but small ($r = .172$). Performance on the inference questions bears little relationship to performance on the *mean* questions. It seems the Grade 1 children were able to recall the facts and recover what was said reasonably well but were unable to draw inferences or come up with two interpretations for the speaker's utterance. In Grade 3 and Grade 5, however, there is a strong positive relationship between performance on the inference questions and on the *mean* questions (Grade 3, $r = .744$; Grade 5, $r = .544$). It appears then, that the older children are better able to use the facts of the story and memory for the speaker's words both to draw inferences and to arrive at both interpretations for the speaker's utterance.

In order to test the hypothesized stages of the text/interpretation distinction, a further analysis of subjects' responses to the *mean* questions was devised. Subjects' responses were categorized in the following way:

1. No recognition that the problem in the story arose from the speaker's utterance or from the listener's misinterpretation of it. This corresponds to our hypothesized first stage in the development of the text/interpretation distinction, *text as intentional structure*. Responses at this level tended to involve elaborations, fabrications or the simple recall of some fact in the story. For instance, one Grade 1 subject answered the question "Why did Lucy say 'That's not what I mean?'" with the response "Because she just wanted to pour lemonade over his head." Furthermore, while the subjects responding at this level often acknowledged that something had gone wrong in the interaction, they simply blamed the listener for failing to act in accordance with the intentions of the speaker, for example in response to the "Why did Lucy say..." question, "Because he (Linus) didn't listen to Lucy."

2. Recognition of a single interpretation for the utterance but no acknowledgement of misinterpretation as such. This corresponds to the hypothesized second stage in the development of the text/interpretation distinction, *text as literal meaning*. Responses at this level refer to either the speaker's intended meaning or the listener's interpreted meaning. A single interpretation, usually but not necessarily the speaker's, is given in response to both probe questions (Q4 and Q5). For example, in response to

Q4, "What did Lucy mean when she said 'Where's the pitcher?'" one young subject replied "She meaned she wanted the pitcher to be ready to play" and in response to Q5 "what did Linus think she meant ...", this same subject replied "the pitcher to start the game". Both these responses refer to the speaker's intention. Alternatively, we found some subjects who responded to both Q4 and Q5 with the listener's interpretation. Hence, the following example: "What did Lucy mean when she said 'Where's the pitcher?'" "To get some lemonade." "What did Linus think she meant..." "To bring the lemonade fast."

3. Recognition that the misinterpretation was valid, that is, resulted from the speaker's utterance being multi-interpretable. This corresponds to the hypothesized third stage in the development of the text/interpretation distinction, *text as interpretable semantic structure*. Responses at this level refer to both the speaker's intended meaning and the listener's interpretation. Thus, a typical response at this level to the "Why did she say 'That's not what I meant'" question would be the following: "Because Linus gave her the pitcher of lemonade and she wanted the baseball pitcher." Note that the misinterpretation is only referred to implicitly. Very occasionally, subjects would make explicit reference to the misinterpretation, for example "It was the wrong *meaning*. She *meant* Charlie Brown, cause he's the pitcher" or "Because she was *talking* about the baseball pitcher, not the pitcher you pour into a cup". Responses like this, which referred specifically to the problem as one of interpretation accounted for less than 3% of the data.

Subjects' responses to the *mean* questions (Q3, Q4 and Q5) combined were characterized as Level 1, Level 2 or Level 3 according to the this scheme. The distribution of responses (as percentages) by Grade and Level are shown in Table 5.

	Hypothesized Text/Interpretation Stages		
	Level 1	Level 2	Level 3
Grade 1	19%	44%	37%
Grade 3	9%	11%	80%
Grade 5	0%	5%	95%

Table 5: Distribution of Responses (Percent) Across Hypothesized Stages of Development in the Text/Interpretation Distinction for Three Grades

The frequency of subjects at each of the three Grades achieving Level 3 responding for at least one of the four stories, was tabulated and subjected to a Chi-square Analysis. The results of this analysis are presented in Table 6.

As Table 5 shows, the frequency of Level 1 and Level 2 responding decreases from Grade 1 to Grade 5, while the frequency of Level 3 responding increases. As Table 6 shows, all Grade 5 subjects achieved Level 3 responding to at least one of the four stories. Indeed,

Level 3 Response

	Present	Absent
Grade 1	10	6
Grade 3	15	1
Grade 5	16	0

$\chi^2_{(2)} = 10.37,\ p<.01$

Table 6: Frequency of Subjects in Grades 1, 3 and 5 Achieving Level 3 Response To At Least One of Four Stories

95% of the Grade 5 responses to the *mean* questions referred to both the speaker's and the listener's interpretations of the critical utterance. Grade 3 subjects performed nearly as well. 15 of the 16 subjects achieved Level 3 at least once, and 80% of subjects' responses referred to both speaker's and listener's interpretations. The performance of the Grade 1 subjects was notably different. Only 10 of the 16 subjects in this grade achieved Level 3 responding even once. Furthermore, only 37% of the Grade 1 responses referred to both the speaker's and listener's interpretations.

The results of this analysis confirm our original hypothesis. Not only were we able to find the three patterns hypothesized, we found that, as we expected, only the youngest children failed to recognize the problem as being one of interpretation and misinterpretation. While relatively few responses failed to acknowledge either the speaker's utterance or the listener's interpretation as central to the problem of each story, we obtained many responses, particularly from the youngest subjects, which appear to reflect the awareness of only a single interpretation for the target utterance (either the speaker's or the listener's). The frequency of responses referring to both the speaker's meaning and the listener's interpretation increases sharply with increasing Grade level. Finally, the very low frequency of responses that refer *explicitly* to the problem of the misinterpretation of language (3%) suggests that there are metalinguistic gains still to be made in the development of the text/interpretation distinction beyond Grade 5.

Our immediate concern, however, is the further elaboration of the earliest stages in this progression. It is clear from these results that we need to collect data on somewhat younger children to fill out our description of the beginning stages of the text/interpretation distinction. As noted above, our current task is beyond the capabilities of most four and five year old children. We are now beginning to pilot test a simpler, more comprehensible task using blocks of assorted shapes and sizes and stuffed animals. We hope, by making the task and our *interpretation* questions more accessible to younger children, to be able to elaborate the earliest stages in this development and perhaps to map the relations between this development and other important developments at around 4 or 5 years of age in the child's conceptions of misrepresentations (false beliefs).

3. *Children's understanding of ambiguity in language and perception.*

Ruffman and Olson are exploring children's understanding of ambiguity more generally. Past research had indicated that until about nine years, most children incorrectly claim that they and another will know what an object is even though the object seen is ambiguous (such as when they and the other can only see a small uninformative segment of the object, which by itself does not indicate what the object is) (Olson and Astington, 1987; Chandler and Helm, 1984).

However, our research this past year (Ruffman and Olson, in preparation; Appendix C.) has shown that almost all five-and-one-half year olds and most four year olds realize that perceptual access, by itself, does not always lead to knowledge when the objects that are seen are ambiguous. In this study, there were four stuffed animals; the *ambiguous* objects (an elephant and a rabbit which were an identical shade of grey), and the *unambiguous* objects (a green turtle and a brown chicken). Each pair of animals was alternately placed in boxes. The boxes had a hole cut in the centre and the hole was small enough so that only the colour of the animals and not the shape could be seen. It was found that most children correctly stated that both they and the other would know what was in the box when the animals were unambiguous (since the animals were different colours), but that they would *not* know what was in the box when the animals were ambiguous (since they were the same colour). Further, they would acknowledge that even if they knew which ambiguous object was in the box another person might not know.

The most likely explanation for the improved performance of the younger children in this new study is simply that the task was made easier for them. This was accomplished by emphasizing that the other would know that the ambiguous animals were the same colour and that the unambiguous animals were different colours. Once children were reminded of this fact they found it easier to assess their own and the other's state of knowledge.

This finding, that most four and six year olds realize they and another will not know what an object is if the object's appearance is ambiguous (*visual* ambiguity), is consistent with another study which investigated children's understanding of an ambiguous message (*spoken* ambiguity). Sodian (in press) had a *speaker* doll place a chocolate in the top of two red drawers and then tell a *listener* doll that, "The chocolate is in the red drawer." This message was ambiguous since there was a second red drawer below. She found that most six year olds and about half of the four year olds correctly stated that the listener doll would not know which drawer the chocolate was actually in. These results for spoken ambiguity are very similar to our results for visual ambiguity.

The results of a second study into children's understanding of spoken ambiguity confuses matters to some extent. As mentioned above, Perner, Leekam and Yuill (in press) carried out a similar task to that of Sodian except that the object (a pencil) was moved to the second red cupboard without the speaker's knowledge. The speaker, but not the child subject, therefore, held a false belief. The speaker then generated an ambiguous message, "the red drawer". When children (four and six year olds) were asked whether the listener would know where the object was, they correctly stated that he would not. Then, when they were asked the belief question, "Which cupboard will (listener) think the pencil is in?", almost all children answered that the listener would think that the pencil was in the old (top) red cupboard. This response is incorrect since the listener has

no way of knowing whether the referent "red cupboard" refers to the top or the bottom red cupboard. Thus, the only correct response to this question is that the listener won't know. Based on their incorrect responses to the belief question, Perner concluded that four and six year old children really do not understand that an ambiguous message leads to an absence of knowledge.

However, in light of our and Sodian's findings this conclusion seems incorrect. We pilot-tested four year olds on both our visual ambiguity task and Perner's false belief/spoken ambiguity task and found that children who clearly understand visual ambiguity and correctly state that they and another will not know what an object is because it is ambiguous, still claim that the listener doll in Perner's task will think the pencil is in the top red cupboard. Thus, the children's incorrect responses to the belief question in Perner's task are not simply a reflection of their misunderstanding the fact that ambiguity limits knowledge aquisition for, if it were, subjects should fail at both Perner's task and our task (which they do not do).

This brings us to our current project. First we intend to show that children who understand spoken ambiguity also understand visual ambiguity so that children will be tested on their understanding of both forms of ambiguity. Children's understanding of ambiguity seems to be reflective of a more general development in cognitive growth which accounts for numerous advances between age four and six. These advances include a developing awareness that another may premise their actions on a false belief, that another may use tricks, lies and secrets or other activities which involve separating beliefs from actions or beliefs from reality (Astington, Harris and Olson, 1988).

Secondly, our research will be aimed at accounting for the differences between the results of Perner on the one hand, and Sodian and ourselves on the other. There are numerous possibilities for the discrepant findings. Our pilot work has shown that one possibility is rooted in the fact that children are more likely to err on a belief question such as is posed in Perner's study when their own knowledge state is discrepant to that of the other (subject knows where the pencil is, other does not know). In contrast, when both the subject and other are ignorant, subjects as young as age four are almost perfect when responding to the belief question. These subjects state that the other will think the object could be in either location. Since the subject's knowledge is discrepant to that of the speaker and listener in Perner's study this may account for these children's errors.

Thirdly, this research has shown that there is often a wide gulf between young children's assessment of another's knowledge (which they do quite well) and assessment of another's beliefs (which they do quite badly). Thus, upon hearing a speaker tell a listener an ambiguous sentence, they correctly judge that the listener will not know and yet when asked what the listener will think they judge the listener to hold the correct belief.

Our suspicions, which we hope to test in the coming year is that the reason children have difficulty in understanding ambiguity is that they have difficulty representing the intentional (belief) state of themselves and others. They know when they and others know or do not know, but they still have difficulty in representing a subjective mental state. And understanding ambiguity requires not only the understanding that the message is inadequate but also understanding what someone else may think upon hearing that ambiguous message.

If this hypothesis is true it would help close the gap between research on children's "theory of mind" and research on children's understanding of misinterpretation.

4. *Children's understanding of the fact that written words can be read in only one way.*

Keenan, Torrance and Olson have begun a pilot study to examine when children come to object to referentially equivalent readings of a visually-presented text. In our proposal we hypothesized that the youngest children would not object to variant readings of a text as long as they were referentially equivalent. Thus younger children might agree that a written word that says "Charlie" on Charlie Brown's T-shirt, also says "Charlie Brown" because both expressions refer to the same individual. In the past year, we have begun to develop and pilot materials that can be used with two-and-a-half to four year old children. Our plan is to teach the children to "read" a word or a short simple sentence and then test their acceptance of systematically-controlled variations of that reading.

Our pilot study used a group a four pictures involving characters from the 'Peanuts' cartoon series with which children are typically familiar (Snoopy, Charlie Brown and Schroeder). At the bottom of each picture, in clear, dark type was printed a single word (on two of the pictures) or a short sentence (on the remaining two pictures).

Five children ranging in age from 4 to 5 years of age have been shown the pictures, have listened to and repeated the word or sentence printed beneath the picture and then have answered a series of eight questions per picture. Questions were of four different types, beginning with one of two stems: "Does this say ..." and "Does this picture show ..."

Questions types were the following :

1. The Target Item was identical to the sentence/word written at the bottom of the picture.

2. A False Distractor involved a sentence or word which falsely described the picture. For example, with the item "Charlie Brown talks on the red telephone" the false sentence distractor read "Does this say 'Charlie Brown is eating the red telephone?'"

3. A True Descriptive Distractor involved a sentence or word that is similar to the original target but not identical. For example, for the item "Schroeder likes to play the piano" the true descriptive distractor would be "Does this say 'Schroeder plays the piano?'" These distractors were truly descriptive of the picture as well.

4. For this pilot we added two other types of distractor items:

    - For sentences, we presented items in which only a change in the Article occurred, rendering a nearly identical reading to that of the target. For example, with the item "Charlie Brown talks on the red telephone" the Article Change distractor read, "Does this say 'Charlie Brown talks on *a* red telephone?'"

- For single words, a Superordinate Distractor consisted of a word or short phrase which was a superordinate description of the target word. For example, for the item "Charlie," the Superordinate distractor read "Does this say 'a little boy?'"

The eight questions were asked in a randomized order for each picture/text combination. The order of the four picture/text combinations was counterbalanced across subjects as was the assignment of Question stems to Item Types.

Pilot work to date gives the results summarized in Table 7, which shows the correct responses as percentages for the "Does this say ..." and "Does this picture show ..." questions.

	Four Year Olds		Five Year Olds	
Question:	Say	Show	Say	Show
Sentence Items:				
Target	50	100	75	100
False	100	100	100	100
True Descriptive	0	100	75	100
Article Change	50	100	50	50
Word Items:				
Target	100	100	100	100
False	50	50	100	100
True Descriptive	100	0	50	75
Superordinate	50	100	100	100

Table 7: Four and Five Year Olds Percent Correct for "Does this say ..." and "Does the picture show ..." Questions

While the number of subjects so far tested is too small to permit statistical analyses, the data does suggest that for the "Does the picture show ..." conditions, all children correctly answered the Target question. Responding was nearly as good in the False distractor condition. For True Descriptive distractors, both four and five year olds performed perfectly in this condition for sentences but did less well in responding to similar single words. Finally with the Article Change distractor, four year olds actually performed better than five year olds while for the Superordinate distractors, responding is perfect for both age groups. Ideally for this task, performance on the "Does the picture show ..." items should be perfect, and in the next phase of piloting, we will work towards development of items in which that is the case. At the very least, this set of questions will be used as control questions in order to determine which three and four year olds will provide useful data on the "Does this say ..." question.

In regards to the "Does it say ..." questions, both four and five year olds seemed to better answer questions involving the "reading" of Word items rather than Sentence items. Overall, four and five year olds did quite well in correctly rejecting the False items. Performance with True Descriptive distractors appeared to be highly variable. Both four and five year olds performed at chance with the Article Change distractors and four year olds' performance was at chance for the Superordinate distractors as well. Thus, having agreed that the sentence says "Charlie", they also agreed that is said "a little boy."

Although our sample is too small to allow the drawing of any firm conclusions, the data is, we believe, supportive of our original hypothesis. We see, for those items where the "picture" question is answered correctly, that five year olds appear to have a more fully developed notion of text as fixed than do younger children. We intend to establish in the coming year, a more fully elaborated description of how this notion of the fixity of text develops in young preschool children.

Finally, we have just begun the development of materials for the proposed study on *Children's understanding of the fact that stories which they are listening to are to be "read" in only one way*. This study will examine the development of children's sensitivity to interpretations, substitutions and distortions in orally-presented stories.

The current status of our work and the next steps.

Our hypotheses regarding what children learn in the course of becoming literate has passed through several stages. Our beginning hypothesis was that both younger children and non-literate adults would tend to identify the meaning of an utterance with the meaning intended by the speaker. We had clear and unequivocal evidence to show that, given an ambiguous message, younger children claimed that what the utterance meant was what the speaker meant by it. There was some counter evidence in the form of the fact that even young children tended to "repair" misstatements. It appears that when they say something they don't mean, the adjust it appropriately. But when someone else does that they seem unable to recognize that there may be a discrepancy between utterance and intention. We continue to consider two possibilities. Perhaps the children acquire the concept of sentence meaning to contrast with speaker meaning, a form of metalinguistic awareness. Alternatively, the children may come to understand that the listener could entertain a belief different from that held by the speaker on the basis of the sentence. We continue to look for ways to choose between these possibilities.

Just how this understanding depends upon writing and literacy remains a bit obscure. If people are in possession of the requisite concepts then they can handle tasks like ours whether they are presented orally or in written form; sensory modality makes no difference. But if the concepts are just being formed, then the written record appears to help the child distinguish the properties of the message from the intentions of the speaker. We take the fact that the physical presence of the written form facilitates the children's making of the utterance/intention distinction as evidence for the role of literacy and writing in the development of these interpretive concepts.

Torrance, Bell and Olson's study can also be seen as indicating the importance of the concepts of sentence meaning and intended meaning to the comprehension process generally. In that study it was found that if children could make the say/mean distinction, they could also distinguish a claim from an inference; they were more likely to recognize what a text had "said" as opposed to the inferences one could make from the text than were children less skilled with the say/mean distinction.

Next steps

We have noticed that the difficulty children have with the say/mean distinction relies heavily upon their understanding of intentionality, the beliefs, desires and intentions of the individuals involved. Recent work on "theories of mind" [Astington, Harris and Olson (Eds.) *Developing theories of mind*, Cambridge University Press, 1988] suggests that children begin to understand that they themselves and others may entertain beliefs which are in fact false when they are four or five years of age. We have interpreted this evidence as indicating children's understanding of misrepresentation. But it leaves open the question of the relation between their understanding of misrepresentation (which they acquire at four) and their understanding of misinterpretation (which they acquire at around six in a literate environment). Why is there a difference between misinterpretation and misrepresentation?

Graham, Babu and Olson have recently collected some preliminary evidence on children's understanding of the relation between what one says and what one thinks. To an adult, what one thinks is equivalent to what one would say, if asked, other things being equal. For children under four years of age, the relation is not that simple. If they are asked, on alternate trials, what a character would say or what a character would think about the content of a box, they give the same answers to the two questions. But if they hear the character claim something about the box, something which the child knows to be false, the child will accurately report the claim but will ignore it in judging what the speaker thinks. The young child apparently believes that the character thinks the same thing that he or she does *in spite of the fact that the character has just said something to the contrary*!

Our approach to the issue of interpretation and misinterpretation in the coming year will build on these leads. We need to, on the one hand, clarify the relation between saying, thinking and meaning and children's understanding of these relations, and on the other, continue to look for the precise relation between these developments and literacy. Several writers, most recently Hedelin and Hjelmquist (1987, mimeo), have presented evidence counter to the hypothesis and this evidence must be integrated into any satisfactory account. Eventually, we will have to do our studies with children and adults from traditional, non-literate societies but those studies are still some time off.

In the meantime, we will have shown that children's understanding of texts and interpretations undergoes a series of transformations, changes which may in part reflect general intellectual growth and in part the acquisition of metalinguistic concepts for referring to, and thinking about, the properties of texts and interpretations. (For more discussion of this topic, see Olson, 1988; Appendix D.)

References

Astington, J. W., Harris, P. L., & Olson, D. R. (Eds.) (1988). Developing theories of mind. Cambridge: Cambridge University Press.

Bonitatibus, G. J., & Flavell, J. H. (1985). The effect of presenting a message in written form on young children's ability to evaluate its communicative adequacy. Developmental Psychology, 21, 455-461.

Chandler, M., & Helm, D. (1984). Developmental changes in the contribution of shared experience to social role taking competence. International Journal of Behavioral Development, 7, 145-156.

Hedelin, & Hjelmquist, E. (1987). Preschool children's mastery of the form/content distinction in comunicative tasks. Department of Psychology, University of Goteborg, Sweden. Mimeo.

Olson, D. R. (1988). Literacy, cognition and the cultural contentions of text: An interview with David Olson. Australian Journal of Reading, 11(2), 105-114.

Olson, D. R. (in preparation). Literacy as metalinguistics. In D. R. Olson & N. Torrance (Eds.), Literacy and orality. Submitted to CUP.

Olson, D. R., & Astington, J. W. (1987). Seeing and knowing. Canadian Journal of Psychology, 41(4), 399-411.

Perner, J., Leekam, S., & Yuill, N. (in press). The message says what the speaker means.

Ruffman, T., & Olson, D. R. (in preparation). Children's ascriptions of knowledge to others. Submitted to Developmental Psychology.

Sodian, B. (in press). Children's attributions of knowledge to the listener in a referential communication task. Child Development.

Torrance, N., & Olson, D. R. (1987). Development of the metalanguage and the acquisition of literacy: A progress report. Interchange, 18(1/2), 136-146.